Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

1. (Currently Amended) A system for sensing a material in a sample, comprising:

a first source configured to emit first optical radiation over a range of wavelengths;

a second source configured to emit second optical radiation at a fixed wavelength;

a first modulator configured to modulate the first optical radiation at a first frequency to generate first modulated optical radiation;

a second modulator configured to modulate the second optical radiation at a second frequency not harmonically related to and different from the first frequency to generate second modulated optical radiation;

a first detector configured to detect the first and second modulated optical radiation ~~after interaction with~~scattered/reflected from the sample and generate a first detection signal;

a first lock-in amplifier configured to process the first detection signal based on the first frequency to produce a first output signal; and

a second lock-in amplifier configured to process the first detection signal based on the second frequency to produce a second output signal.

2. (Original) The system of claim 1, wherein the first source includes a distributed feedback (DFB) laser.

3. (Original) The system of claim 1, further comprising:

a coupler connected to the first modulator and the second modulator configured to combine the first modulated optical radiation into a combined signal; and

an optical amplifier connected to the coupler and configured to amplify the combined signal.

4. (Original) The system of claim 1, further comprising:

a second detector configured to detect the first and second modulated optical radiation before interaction with the sample and generate a second detection signal;

a third lock-in amplifier configured to process the second detection signal based on the first frequency to produce a third output signal; and

a fourth lock-in amplifier configured to process the second detection signal based on the second frequency to produce a fourth output signal.

5. (Original) The system of claim 4, wherein material in the sample produces a spectral feature within the range of wavelengths, the system further comprising:

a processor configured to process the first output signal, the second output signal, the third output signal, and the fourth output signal to obtain information relating to the spectral feature.

6. (Original) The system of claim 5, wherein the information includes a concentration of the material in the sample.

7. (Currently Amended) A method of remotely sensing a sample, comprising:

transmitting a beam of optical radiation toward the sample, the beam including an amplitude modulated~~a varying~~ component at a first frequency and another amplitude modulated~~a fixed~~ component at a second frequency, wherein the first frequency is not harmonically related to and is different from the second frequency;

detecting the beam of optical radiation after ~~interaction with~~scattering/reflecting from the sample to produce a remote detection signal;

determining a portion of the remote detection signal that is present at the first frequency;

determining another portion of the remote detection signal that is present at the second frequency; and

obtaining information about the sample based on the portion of the remote detection signal and the ~~an~~other portion of the remote detection signal.

8. (Currently Amended) The method of claim 7, further comprising:

generating a tuning signal that periodically sweeps over a range of wavelengths at a sweep frequency;

generating a reference signal having a reference wavelength;

modulating the tuning signal at the first frequency to produce the ~~varying component~~amplitude modulation at the first frequency;

modulating the reference signal at the second frequency to produce the ~~fixed component~~amplitude modulation at the second frequency; and

combining the ~~varying component~~tuning signal and the ~~fixed component~~reference signal into the beam of optical radiation.

9. (Original) The method of claim 8, further comprising:

amplifying the beam of optical radiation before the transmitting.

10. (Currently Amended) The method of claim 7, further comprising:

detecting the beam of optical radiation before ~~interaction with~~scattering/reflecting from the sample to produce a local detection signal;

determining a portion of the local detection signal that is present at the first frequency; and

determining another portion of the local detection signal that is present at the second frequency.

11. (Original) The method of claim 7, wherein the obtaining includes:

obtaining information about the sample based on the portion of the local detection signal and the other portion of the local detection signal.

12. (Currently Amended) A system for sensing a characteristic of a sample, comprising:

a tunable wavelength source configured to emit first optical radiation that varies over a wavelength range at a sweep frequency;

a reference source configured to emit second optical radiation at a fixed reference wavelength;

a first modulator configured to modulate the first optical radiation at a first frequency;

a second modulator configured to modulate the second optical radiation at a second frequency that is different from the first frequency and the sweep frequency, and is not harmonically related to the first frequency;

a science detector configured to detect the optical radiation from the first modulator and the second modulator after ~~interaction with~~scattering/reflecting from the sample and generate a science signal;

a plurality of lock-in amplifiers respectively configured to generate components of the science signal that are present at the first and second frequencies; and

a processor configured to determine a characteristic of the sample based on the components of the science signal that are present at the first and second frequencies.

13. (Original) The system of claim 12, further comprising:

a coupler configured to combine the optical radiation from the first modulator and the second modulator into a combined signal.

14. (Original) The system of claim 13, further comprising:

an optical amplifier connected to the coupler and configured to amplify the combined signal and transmit the combined signal toward the sample.

15. (Currently Amended) The system of claim 12, further comprising:

a reference detector configured to detect the optical radiation from the first modulator and the second modulator before ~~interaction with~~scattering/reflecting from the sample and generate a reference signal; and

a second plurality of lock-in amplifiers respectively configured to generate components of the reference signal that are present at the first and second frequencies.

16. (Original) The system of claim 15, wherein the processor is further configured to determine the characteristic of the sample based on the components of the reference signal that are present at the first and second frequencies.

17. (Original) The system of claim 12, wherein the sweep frequency is lower than the first frequency and the second frequency.

18. (Original) The system of claim 12, wherein the reference wavelength lies outside the wavelength range.

19. (Currently Amended) A method of determining a concentration of material in a sample, comprising:

modulating wavelength-varying radiation at a first frequency;

modulating fixed-wavelength radiation at a second frequency;

detecting the wavelength-varying radiation and the fixed-wavelength radiation before ~~interaction with~~scattering/reflecting from the sample to produce a local detection signal;

transmitting the wavelength-varying radiation and the fixed-wavelength radiation to the sample;

detecting the wavelength-varying radiation and the fixed-wavelength radiation after ~~interaction with~~scattering/reflecting from the sample to produce a remote detection signal;

determining portions of the local detection signal and the remote detection signal at the first frequency;

determining portions of the local detection signal and the remote detection signal at the second frequency;

obtaining a transmission profile from the portions of the local detection signal and the remote detection signal at the first frequency and at the second frequency; and

calculating the concentration of the material based on the transmission profile,

wherein the first frequency is not harmonically related to and is different from the second frequency.

20. (Original) The method of claim 19, wherein the obtaining includes:

multiplying the portion of the remote detection signal at the first frequency by the portion of the local detection signal at the second frequency to obtain a first product, and

dividing the first product by a second product of the portion of the local detection signal at the first frequency by the portion of the remote detection signal at the second frequency.

21. (Currently Amended) A system for remotely sensing a sample, comprising:

means for generating wavelength-varying radiation and fixed-wavelength radiation;

means for modulating the wavelength-varying radiation at a first frequency;

means for modulating the fixed-wavelength radiation at a second frequency; and

means for detecting radiation at the first and second frequencies using a phase sensitive technique after the wavelength-varying radiation and the fixed-wavelength radiation have ~~interacted with~~scattered/reflected from the sample,

wherein the first frequency is not harmonically related to and is different from the second frequency.

22. (Currently Amended) The system of claim 21, further comprising:

means for detecting radiation at the first and second frequencies using a phase sensitive technique before the wavelength-varying radiation and the fixed-wavelength radiation have ~~interacted with~~scattered/reflected from the sample.